FIG. 2. Head capsule (frontal view) of the first instar larva of *Amphidecta reynoldsi*.

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DISPLAY OF THE "PEACOCK MOTH": *BRENTHIA* SPP. (CHOREUTIDAE: BRENTHIINAE)

Additional key words: *Anacampsis*, Cosmopterigidae, Celechiidae, Momphidae, *Tebenna*, Tineidae, *Tortyra*.

Species of *Brenthia* Clemens, 1860 (Choreutidae: Brenthiinae) are diurnal microlepidopterans of both New and Old Worlds, with the majority of the 60–80 species confined to tropical areas. Several species are seen frequently in the lowland forests of the Republic of Panama, where they dart about on foliage, with their wings held in distinctive, peacock-like displays (Fig. 1). As the name of the type species, *Brenthia pavonacella* Clemens, 1860, suggests, "peacock" displays are common in *Brenthia*.

Descriptions of these displays are scattered in the literature. Of *B. pavonacella*, in northeastern U.S.A., Forbes (1923:353) comments, "The moth struts about on alighting, with hind wings displayed like *Glyphipteryx* [Cosmopterigidae], the smaller *Anacampsis* [Curtis, 1827, Gelechiidae], etc." And, of *B. coronigera* Meyrick, 1918, in India, Fletcher (1920:128) remarks that "The moths strut about jerkily with the hindwings carried nearly at a right angle with the forewings, so that the wings form a sort of cone when seen from behind the insect. This attitude is characteristic of other species of this genus." His account includes an illustrated lateral view of the moth displaying. According to Robinson et al. (1994:111, 113), some species of South-East Asian Choreutidae ". . . rest with the hind wing drawn forward in front of the forewing. Species of *Brenthia* also move holding their wings in this posture and are mimics of jumping spiders (Salticidae). . . . the metallic spots of the wing pattern representing the spider's eyes."

The purpose of this note is to further describe the display and clarify certain points pertaining to its me-

FIG. 1. *Brenthia* sp. nr. *confluxana* (Walker, 1863) wild adult displaying on a leaf. The two images shown are a side view (left), with the wings partly raised, and a rear view (right), with the wings in full display, of one and the same individual. To produce the photograph, two digitized images were overlain and matched up using the leaf debris as a guide. The photos were then cropped and fused to produce an image that aids visualization of the moth's darting movement. Photographs taken 7 April 1982, on Barro Colorado Island, by A. Aiello.

chanics, based on observations of several species of *Brenthia* in the Republic of Panama, and to comment briefly on display poses of other choreutids and other microlepidopterans. The 3 or 4 *Brenthia* species studied were not identified beyond genus, because authoritative species-level identifications are possible in the genus *Brenthia* only with genitalic dissection of males of species described by Meyrick and illustrated by Clarke (1969). Lot numbers are those of Aiello, and consist of the year plus a sequential number.

Specimens and observations. On 7 April 1982, on Barro Colorado Island, wild adults of *Brenthia* sp. nr. *confluxana* (Walker, 1863), were observed and photographed while they displayed on leaves (Fig. 1). On 12 January 1992, in Arraiján, Panama, two larvae of an unidentified species of *Brenthia* (sp. 1) were collected on *Cojoba rufescens* (Benth., 1845) Britton & Rose, 1928 (Mimosaceae), and reared to adults (Aiello lot 1992–5). Two more adults, apparently of *Brenthia* sp. 1, were collected for laboratory observation on 2 and 9 December 2001, in Arraiján. On 26 August 1993, on Barro Colorado Island, Donald Windsor (Smithsonian Tropical Research Institute, Panama–STRI) collected three pupae of a larger species of *Brenthia* (sp. 2) on *Calathea* sp. G. May, 1818 (Marantaceae). Adults were obtained from all three pupae (Aiello lot 1993–70).

Observations of the displays of six reared and two wild caught Panamanian *Brenthia* adults, under a dissecting microscope, revealed that their wing orientations were at odds with published reports that the moths draw the hind wings forward in front of the forewings to produce their displays. If they did do that, the dorsal surfaces of both hind and forewings would be visible when the display is viewed from in front (Fig. 2a), the hind and forewings would have to de-

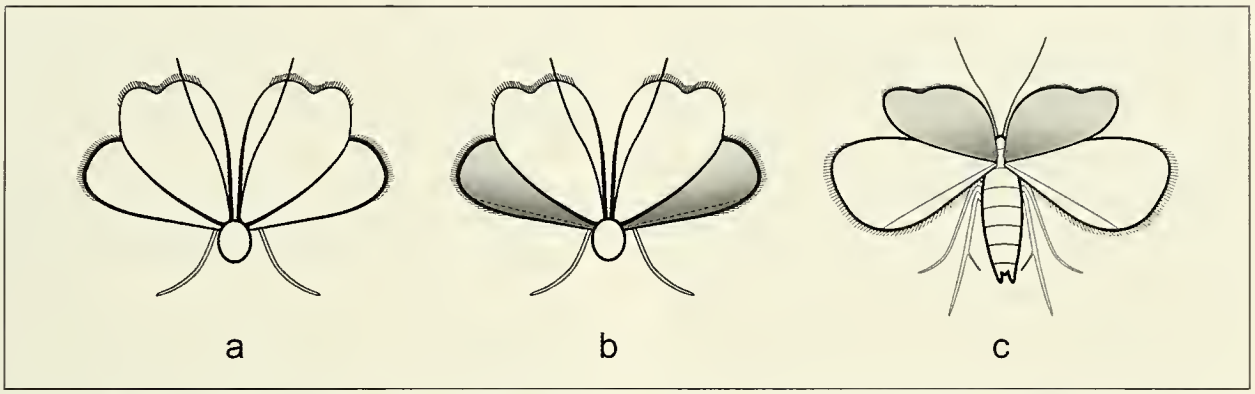

FIG. 2. Wing orientation diagrams (**white = dorsal** surface; **gray = ventral** surface): **a,** Front view. If the hind wings were drawn in front of the forewings, as stated in the literature, the dorsal surfaces of both wings would be visible; **b,** Front view. When hind wings were drawn upward by the forewings, in Panamanian *Brenthia* spp., the dorsal surface of the forewing and ventral surface of the hind wing were visible; **c,** Rear view. When hind wings were drawn upward by the forewings, in Panamanian *Brenthia* spp., the ventral surface of the forewing and the dorsal surface of the hind wing were visible.

couple, the costal margin of the forewing would be brought into contact with the posterior margin of the hind wing, and the hind wing would have to tilt forward.

Contrary to that, the moths we observed did not draw the hind wings forward in front of the forewings. Rather, they simply tilted the forewings to an angle 45 degrees to the body, thus drawing the costal margin of the hind wings up by means of the coupled frenulum and retinaculum, so that the hind wings were perpendicular to the forewings, and the wings and body formed a forward-pointing cone. In that pose, the ventral (not dorsal) surface of the hind wings was presented when the display was viewed from in front (Fig. 2b), and the costal margins of hind and forewings remained coupled with one another. Accentuating the conical shape of the display, the hind wing anal vein (A2) was creased strongly, so that its anal area (posterior margin) was perpendicular to the rest of the wing, and its posterior margin (edge) was directed towards the body (Fig. 2c).

Consistent with our observations of living moths, experimental manipulations of two individuals soon after death revealed that when the wings were in the normal resting position, folded over the body as a flat triangle, the display could be duplicated easily, merely by lifting the forewings.

We suspect that this simple display mechanism will prove universal in *Brenthia*. The illustrations of *B. coronigera* in Fletcher (1920, plate 32) show that the hind wing pattern of the spread moth (dorsal view) is different from the hind wing pattern of the displaying moth (lateral view), indicating that the ventral (not dorsal) surface of the hind wing was brought into view during the display, just as with Panamanian *Brenthia*.

Display behaviors in other choreutids. Though striking patterns and metallic wing markings are found in many choreutid genera, as far as is known, peacock-like displays are peculiar to *Brenthia*. However, a lesser degree of wing lifting was reported for another choreutid, *Tebenna micalis* (Mann, 1857), by Common (1993:292): ". . . they settle with their wings partly raised and curled. They walk erratically with a rapid jerky gait and, if disturbed, readily take to flight." Members of another choreutid genus, *Tortyra* Walker, 1863, rest with the wings rolled around the body, the wing tips curved and covering the tip of the abdomen, and the antennae displayed forwards. The effect is of a metallic chrysomelid beetle (VOB unpublished observation). In contrast, species of the choreutid genus *Hemerophila* Hübner, 1817, rest with their colorful wings flat against the leaves (VOB unpublished observations in Brasil, AA unpublished observations in Panama).

Though it is easy to speculate that such displays play a courtship role, their true function is not known. Displays may be repeated for hours at a time whether or not other individuals are present, and both sexes perform them, apparently identically. Adults of 2 Panamanian *Brenthia* species performed these displays shortly after eclosion in the individual petri dishes in which they had been reared. Observations on the immature stages of *Brenthia* are presented by Aiello and Solis (2003).

Display behaviors in other microlepidoptera. The dance displays that occur in a variety of other Microlepidoptera, involve whirling or gyrations, but not wing manipulations. Such dance-like gyrations are performed by 'dancing moths,' *Dryadaula terpsichorella* (Busck, 1910) (Tineidae), upon alighting (Swezey 1909:20). According to Robinson (1988:73),

Callicerastis stagmatias Meyrick, 1916 (Tineidae), in W. Malaysia, performs a ". . . dance on a leaf," and ". . . similar gyratory movements have also been observed in laboratory stock of *Opogona flavofasciata* (Stainton, 1859) (Tineidae: Hieroxestinae), but these are performed for only a few seconds." Forbes (1923:277) wrote of *Anacampsis* (Gelechiidae) that "The moths of *A. agrimoniella* [(Clemens, 1860)] and *A. levipedella* [(Clemens, 1863)], at least, walk in a circle on alighting. . . ." Also in the Gelechiidae, *Commatica falcatella* (Walker, 1864) and *C. cryptina* (Walsingham, 1911) have been seen spinning on leaves in Mexico and Costa Rica (VOB unpublished observation), and in Panama (AA unpublished observation). Also seen spinning on leaves, in Panama, is an as yet unidentified member of the Cosmopterigidae (AA unpublished observation). Plant (1980:255) described a spinning dance in *Mompha nodicolella* Fuchs, 1902 (Momphidae) in Britain, and Robinson (1988:73), observed ". . . an unidentified species of Momphidae in Sulawesi and Malaysia. This moth performs its dance on the upper and under-surfaces of leaves of a variety of plant species in rain forest, running in tight circles both clockwise and anticlockwise." It has been speculated that the displays of microlepidoptera ". . . may have a function in courtship. . . ." (Robinson et al. 1988:11), but in most species their purpose remains unknown.

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